Effect of exposure of the 25 mg dapivirine vaginal ring to cleaning solutions and personal lubricants

Effect of Exposure of the 25 mg Dapivirine Vaginal Ring to Cleaning Solutions and Personal Lubricants

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Key points

1. The stability of the dapivirine vaginal ring upon exposure to wash solutions or personal lubricants is unknown. Ring discolouration has been observed post-use in some clinical studies.

2. Exposure to lubricants, soaps or other washes produced no substantial impact on the assay of DPV in any of the rings tested.

3. No new degradation products (relative to the untreated control) ≥ 0.1% were observed in any of the treatment solutions. Total degradation products were comparable to the control for all treatment solutions.

Background

During use, vaginal rings may be exposed to various personal/domestic cleaning agents or personal lubricants. These products have the potential to extract drug from the ring or degrade drug within the ring. Here, we investigated exposure of the 25 mg dapivirine (DPV) vaginal ring to a range of such products, including bath salt brands widely available in South Africa, commonly used liquid detergents, commercial vaginal lubricants and household bleach products (Fig. 1).

Objectives

1. Expose 25 mg DPV rings to a selection of personal care and cleaning solutions.

2. Assess DPV stability within the ring by quantifying drug content post exposure.

3. Examine the ring extracts for breakdown products relative to untreated controls utilizing a degradation products gradient HPLC method.

Methods

International Partnership for Microbicides' 25 mg DPV vaginal rings were manufactured by QPharma (Malmö, Sweden). Rings were exposed for different time periods to solutions of household bleach (Domestos), a surfactant-based liquid soap (Fairy Liquid), three different bath salts (Revive, Sols, DeWitt's), and three different personal lubricants (aqueous, mineral oil or silicone-based; Replens, Super Slik Lube and Sliquid Silver). Water, simulated vaginal fluid (SVF) containing 0.2% w/v Tween 80 (SVF+Tween), and no exposure were used as controls. Rings were rinsed, sectioned and extracted with acetone. Extraction solutions were analysed by HPLC for DPV content and degradation products using gradient HPLC. All peaks identified as equivalent to greater than 0.1% w/w were investigated and a plausible explanation for peak appearance was determined.

Results & Discussion

Fig. 1. Personal lubricants and household cleaning agents tested in the study.

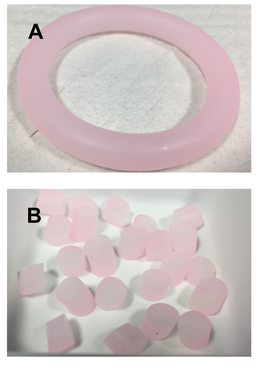

Fig. 2. 25 mg DPV rings following exposure to Sols bath salt solution for 3 hours at 40˚C; A – intact ring, B – ring sections.

The mean residual DPV content values for rings exposed to the various test solutions are presented in Table 1. The mean minimum amount of DPV recovered was 24.17 mg per ring, equivalent to 99.1% of the theoretical recovery, assuming a 24.4 mg/ring mean loading for the batch. A pink discolouration was observed on rings exposed to Sols bath salts solution (Fig. 2A) which was not removed on rinsing with deionised water. Sectioning the rings revealed some penetration of the colour (Fig. 2B). The discolouration seen in this study is consistent with that observed previously for some used silicone elastomer rings returned from clinical sites. It was not associated with a change in the DPV assay or any drug degradation.

The average sum of degradation products measured following ring exposure to the bath salts, bleach or detergent is presented in Table 2. No new degradation peaks (> 0.1% w/w) which could only be attributed to the wash or bath salt solutions were identified. The observed discolouration is consistent with that previously observed in some used silicone elastomer rings returned from clinical sites. For all treatments, the total degradation products were comparable to control rings extracted without treatment.

Table 1. Summary of the experimental conditions and treatments tested as well as mean DPV recovery post-treatment. * Assessed as percent of the mean batch ring content of 24.4 mg DPV per ring.

Wash solution	Time (hr)	Temp. (˚C)	Mean recovery* (%)
Untreated	-	-	100.2
SVF+Tween	4	37	99.8
Super Slik Lube:SVF+Tween (3:1)	4	37	99.1
Replens MD:SVF+Tween (3:1)	4	37	99.1
Sliquid Silver Luxury Silicone Lubricant:SVF+Tween (3:1)	4	37	99.8
Detergent (Fairy Liquid):water (1:4)	1	50	102.5
Bleach (Domestos):water (1:4)	1	50	103.5
Water	3	40	101.7
Revive Bath Salts solution	3	40	102.0
Sols Bath Salts solution	3	40	101.2
DeWitt's Bath Salts solution	3	40	101.2

Table 2. Summary of the unknown peaks observed in the degradation products assay with each treatment. Unk – unknown.

Treatment	Average sum (%) of degradation products	Number of unknowns	Unknowns > 0.1%
Untreated	0.4	4	Unk 1 & 2
Detergent in water	0.4	6	Unk 1 & 2
Bleach in water	0.4	3	Unk 1 & 2
Water	0.3	5	0
Revive Bath Salts solution	0.4	6	0
Sols Bath Salts solution	0.4	7	0
DeWitt's Bath Salts solution	0.3	5	0